JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

Entered as second class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the act of Congress March 3, 1879.

VOL. XXXIV NO. 7 SAN FRANCISCO, FEBRUARY 13, 1915 PER COPY, 25 CENTS

SPORADIC INSULATOR TROUBLES.
BY P. M. DOWNING.

THE JITNEY BUS.
BY CHAS. N. BLACK.

TABULATING MACHINES FOR CORPORATION ACCOUNTING AND STATISTICAL WORK.
BY E. A. WEST.

FUEL OIL BURNING.
BY F. B. DUNN.

MATERIALS ADVERTISED IN THIS ISSUE

Batteries
Edison Storage Battery Supply Co.

Boiler Feed Water Treatment
Dearborn Chemical Co.

Diesel Engines
Busch-Sulzer Bros. Diesel Eng. Co.

Fans
Pacific States Electric Co.

Fixtures
Westinghouse Elec. & Mfg. Co.

Heating Appliances
Simplex Electric Heating Co.

Insulators
Hemingray Glass Co.
Pierson, Roeding & Co.
Thomas & Sons

Motors
Century Electric Co.

Piping
Pittsburg Piping & Equipment Co.

Power Plants
Chas. C. Moore & Co.

Push Button Sockets
Cutler-Hammer Co.

Staples
Blake Signal & Mfg. Co.

Transformers
Wagner Electric Co.

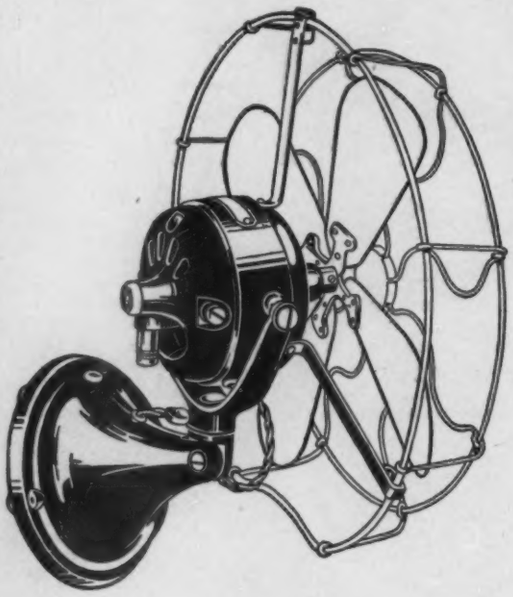
Transportation
Southern Pacific Co.

Turbines
Pelton Water Wheel Co.

Wire (Trolley)
"Phono," Pierson, Roeding & Co.

Wire and Cable
Habirshaw Wire Co.
Indiana Rubber Co.
The Okonite Co.

Alphabetical Index to Advertisers, Page 8 **Where to Buy It in the West, Page 9**



Always ready for work—

This is the efficiency distinguishing

ELECTRIC FANS

For durability, permanency, strength, and smoothness of action, they have no superior.

As complete satisfaction givers and business builders, they will more than meet your expectations as well as add materially to that reputation for SERVICE you are ambitious to further develop.

G-E Fans are made of marine bronze, self aligning, and are frictionlesss.

The oscillating mechanism controlling the alternating motion is strongly and substantially made.

The motors are of the well known **G-E** High Quality Standard and can be furnished in any finish to match work of any style or trimming.

PACIFIC STATES ELECTRIC CO.

The Modern Electrical Supply House

Distributors for the Pacific Coast

LOS ANGELES OAKLAND PORTLAND SAN FRANCISCO SEATTLE

HITCHCOCK MILITARY ACADEMY

(ACCREDITED)

SAN RAFAEL, CAL.

The Only School in the West having Separate Rooms for Each Boy

Large campus gymnasium. Indoor rifle range. Easter term begins January 11, 1915. Cadets may enter any time. Summer camp on Eel River, June to August. Catalogue on application.

PRINCIPALS

REX W. SHERER S. J. HALLEY

INDIANA RUBBER AND INSULATED WIRE CO.

Paranite Rubber Covered Wires and Cables

IF IT'S **PARANITE** IT'S RIGHT

More Than Code Requires

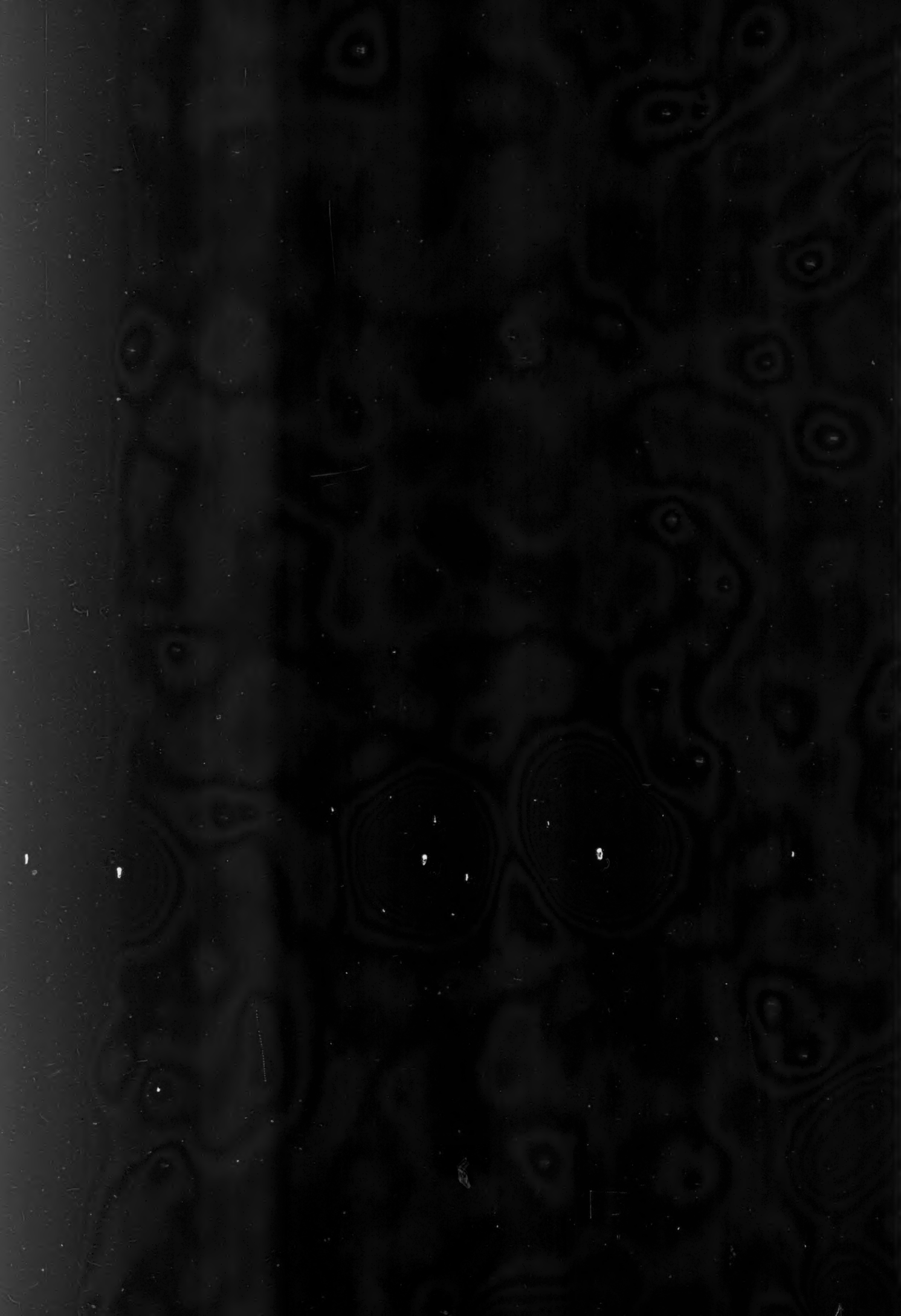
Underground, Aerial, Submarine and Inside use

Telephone, Telegraph and Fire Alarm Cables

FACTORY AND GENERAL OFFICES
JONESBORO, IND.

Chicago Office, 210 So. Desplaines St.
Chicago, Illinois.

FOBES SUPPLY COMPANY, Agents
Portland, Oregon Seattle, Washington



FEB 16 1915 ©CLB329457

JOURNAL OF ELECTRICITY
POWER AND GAS
Devoted to the Conversion, Transmission and Distribution of Energy

VOLUME XXXIV SAN FRANCISCO, FEBRUARY 13, 1915 NUMBER 7

[COPYRIGHT 1915 BY TECHNICAL PUBLISHING COMPANY]

SPORADIC INSULATOR TROUBLES

BY P. M. DOWNING.

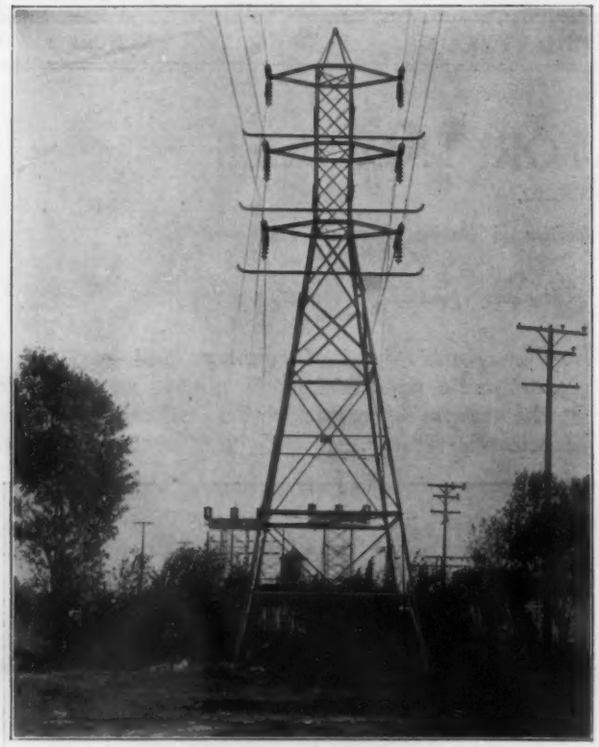
(This paper presents an account of insulator difficulties in Pacific Coast high tension practice. It was one of several presented at a symposium on the matter before the November meeting of the San Francisco Section of the American Institute of Electrical Engineers. The other papers and discussions will be published in future issues. Mr. Downing is engineer of maintenance and operation for the Pacific Gas & Electric Co.—The Editor.)

Every utility company engaged in selling electric energy for power and lighting purposes is vitally interested in furnishing cheap, continuous and reliable service. On the Pacific Coast, owing to the high cost of fuel, a large part of this energy is generated at hydroelectric plants and transmitted for considerable distances at high voltages. In many instances these transmission systems embrace hundreds and possibly thousands of miles of high voltage line, and when you consider that these lines are constructed through every imaginable kind of country, and exposed to every climatic condition, it is not at all surprising that the transmission line is the weakest link in any hydroelectric system. A slide may occur in a ditch, or a flume may go out, thus reducing, or shutting off entirely the water supply of a power house, or trouble may develop in the power house or substation apparatus without affecting service in any way, but the real troubles of a power transmission company are line troubles.

Modern High Tension Tower and Insulators.

Disturbances of this kind are so far reaching, and so general in their effect on service over the entire system, that it may be safe to say that the continuity of service furnished from any transmission line is dependent upon the stability of the line.

As the time allowed for the reading of the different papers to be presented this evening is somewhat limited, I will not attempt to cover the entire subject at great length, but will confine my remarks to



Last Tower of Southern Sierra Power Company's 240-mile Transmission Line.

a discussion of the troubles experienced in connection with the operation of high voltage grounded neutral systems using the common pin type insulators.

Actual results extending over a period of several years show that on one system operating in California, approximately 82 per cent of all interruptions to service were caused by line troubles. Of these, approximately 55 per cent were of a temporary nature, and caused only momentary drops in voltage.

These temporary disturbances are generally the result of arcing between conductors, or between one conductor and ground, and clear themselves as soon as the voltage drops. They are not serious in their effect on the service, as in a majority of cases they do not last long enough for switching to be done either automatically or manually. Very often the burned remains of cranes, pelicans, or other birds having a wide spread to their wings, are found lying under the line, or tree squirrels, smaller birds, etc., found at the base of the pole furnish substantial evidence as to causes of the disturbances.

Burned poles cause approximately 9 per cent of all line troubles. These are much more serious in their effect on the service than the momentary drops in voltage, as they leave the line inoperative, and the interruptions, therefore, are of longer duration because of the time required to do the switching. These fires occur as the result of leakage over the surface of the insulators, and as yet there does not seem to be any satisfactory explanation of why they occur or how they can be prevented. The amount of leakage, as measured in amperes, is so small that it cannot be detected as an unbalance in load. Insulators, which in the laboratory will not flash over on either dry or wet tests at voltages several times that under which they normally operate, will under certain climatic conditions leak over and start pole fires.

Pole fires occur most often in the autumn, when the heavy fogs or early rains fall on a summer's accumulation of dust and form a low resistance leakage path to ground over the surface of the insulator. However, there is no reason to think that this accumulation of dirt is alone responsible for the burning. On the contrary, there is every reason to think that there are other elements involved. It is not unusual to have the burning take place on lines where the insulators will have been cleaned not more than a few days previously. Lines in the mountains, or outside of the fog districts, give less trouble than those near the bay; again, there is less trouble on tall poles than on short ones, for example, there is less trouble where the insulators are 40 to 50 ft. above the ground than where this distance is only 25 to 30 ft. During the winter months after the heavy rains have had an opportunity to wash off the dirt, the trouble disappears almost entirely.

There are two ways of reducing the liability of trouble of this kind:

First: Metal pins connected together electrically, but not grounded, should be used. Ordinary No. 9 galvanized iron wire wrapped around the pins and fastened to the pole and arm with staples, has been found to be satisfactory. The shorting wire should be carried down to below where the quarter brace is attached to the pole. Grounding the pins does not give any additional safety against burning, and is objectionable because the arcing distance from line wire to ground is greatly reduced.

Second: Insulators, particularly those on lines around the bay, should be cleaned at least once each year just before the rainy season sets in. The usual way of doing this is to use a cloth saturated with kerosene. As I have already stated, cleaning in this way does not always eliminate the trouble and undoubtedly better results would be obtained if the insulators were all taken off the line and washed thoroughly. This, however, is impracticable because of the time and the expense involved.

The design of the insulator has considerable to do with the leakage. As indicating the results that might be expected from the use of different types of insulators, I have in mind an 11,000 volt line constructed along a public highway near the bay, on which was originally used 11 in. two-part porcelain insulators, designed to operate at 40,000 or 50,000 volts. The location of this line is such that considerable dust accumulates on the insulators, but even when they were clean there was so much trouble from poles burning, that at times it was almost impossible to keep the line in service. Subsequently, these 11 in. insulators were replaced by 7 in. glass carried

on the same pins and since the change was made notwithstanding the fact that they are now seldom, if ever, cleaned, the burning has almost entirely stopped.

It will be of interest to know that these same 11 in. insulators are today in use on a 60,000 volt line in the foothill section, where they are not subjected to the same dust and fog, and are giving excellent service.

The surface glaze of porcelain insulators manufactured during the past few years does not seem to deteriorate with age to any appreciable extent. Some of the insulators used on lines built during the early

Cordelia Substation of Pacific Gas & Electric Co.

days of high voltage work had to be replaced after being in service for a few years. Generally, however, it will be found that where the insulator has deteriorated to any great extent, either the quality of material itself is poor or it has been improperly handled. With the material now available and the present day knowledge of the art of manufacturing insulators, there is little reason to expect much further trouble from this source.

Some trouble is had with the tops of the larger diameter porcelain insulators cracking, as a result, perhaps, of the expansion and contraction due to wide temperature variations. It is not unusual to have this trouble with glass insulators, and for this reason porcelain has almost entirely superseded glass for the larger sizes. These cracks appear on the surface of the insulator as fine hair lines extending radially from the outer circumference to the top of the biscuit. They cannot be seen from the ground, and are quite hard to detect even by close and careful inspection. Although, obviously, shortening the leakage path to ground, there generally remains a sufficient margin of safety to prevent failure before they are located. Although the general appearance of the insulator does not in every instance indicate it, there is every reason to think that the failures have occurred on over-fired units that are too brittle to stand the internal strains set up under sudden or wide temperature changes.

Insulator failures due to puncture seldom occur on star connected lines where the neutral is grounded. Lightning occasionally causes trouble but it is just as liable to damage the pole or the line without damaging the insulator as it is to damage the insulator itself. Although but very few of the operating companies of California have installed lightning arresters, or protective devices, other than the old horn type spark gap with one side grounded, but little trouble is experienced from this source. In a few instances lightning has been known to strike high voltage lines, burn off one or more conductors in the middle of a span or slightly damage a few poles without affecting the insulators. Oftentimes when disturbances of this kind happen near a station housing transformers or similar apparatus, the voltage will jump to ground either around the terminal bushings or at some other point where the distance will permit, without otherwise damaging the apparatus in any way.

The suspension type of insulator has not been tried out as thoroughly as the pin type, but thus far there is every reason to think that it will eventually succeed the latter on all high voltage work regardless of whether the supporting structures be wood poles or steel towers. The pin type insulator has about reached its limitations both electrically and mechanically and the time is not far distant when the manufacturers will be forced to re-rate them on a more conservative basis.

The continually increasing demands of the general public for better service will compel utility companies to improve their facilities for giving service by building up and strengthening the weak points.

On most long distance transmission systems too much attention has been devoted to other parts of the system, leaving the economies to be made on the line. This has resulted in the use of too short poles, too light towers, insufficient insulation, etc., any one or all of which would represent a saving in first cost insignificant as compared with the loss that might be sustained by a single interruption to service as a result of such false economies.

Methods of stream measurement will be displayed by the U. S. Geological Survey at its Panama-Pacific Exposition exhibit. The showing will include an artificial river where fluctuations will be automatically measured by electrically-operated gages.

Potash from feldspar is commercially feasible with the cutting off of the supply from Germany. By heating ground feldspar with calcium chloride, a by-product from the ammonia-soda-alkali process, in an oil-fired cement kiln it is now possible to manufacture potassium chloride at less than $8.00 per ton. Beside its use as a fertilizer this material is also used for making soap, matches and in many other chemical industries, over $8,000,000 worth having been imported for the fiscal year ending June 30, 1914.

THE JITNEY BUS.

BY CHAS. N. BLACK.

(The economic impracticability of this new form of city transit is clearly pointed out in this paper. Mr. Black is vice-president and general manager of the United Railroads of San Francisco and past-president of the American Electric Railway Association. This paper, embodying his views on the subject has been read before several local organizations and have been instrumental in creating a favorable public opinion toward the electric railway companies.—The Editor.)

It affords me great pleasure to have this opportunty to meet with you and discuss what has recently become a live issue with almost all of the existing urban and interurban transportation systems west of the Mississippi River, viz: the problem of the jitney bus.

Rarely in the development of any industry has there come out of a clear sky a greater shock than has been caused by the advent of the jitney. An industry which has taken years and enormous sums of money to develop, suddenly and without warning finds itself confronted with practically a total loss of its net revenue, for no electric railway has a sufficient margin after deducting operating expenses and taxes, to sustain a loss of from 20 to 30 per cent, as, apparently, has been the case in some instances, and continue to meet its fixed charges.

It will logically follow, therefore, that if the jitney is a real advance in transportation service, existing street and interurban railways will have to be discarded. But before admitting the possibility of such an outcome, and before encouraging the development of the auto bus, it should be shown that it can perform all the functions of an electric car as efficiently and as economically, for unless it can meet at least one of these conditions, it will unquestionably fail, and unless it can fulfill both, its development will be most uncertain.

The greatest and most serious problem confronting every street railway in this country is handling the people during the so-called rush hours, which usually occur in the morning between 7 and 9 o'clock, and more especially in the afternoon between 4:30 and 6 o'clock, when, for example, in San Francisco on Market street, west of Third, we are called upon to transport the people at the rate of over 15,000 per hour in each direction, which means a car on both inbound and outbound track every 25 seconds.

It is not possible to conceive of any development of the jitney bus which will handle this number of people at this rate, unless the entire street is given up to their use, and even then the congestion would be impossible.

Both London and Paris have been developing the auto bus for a number of years, and statistics from these cities can be readily obtained showing the maximum carrying capacity of their bus lines. In London double deck auto buses are in use. In Paris they were formerly used, but have been abandoned as it was found that the accidents resulting from the people attempting to reach the upper deck were very serious, and further, because the loading and unloading time required was excessive. From the experience of both of these cities we can safely conclude that any auto bus, such as has been developed abroad, would not be a satisfactory substitute for our existing street cars.

So let us, for the sake of the argument, base our calculations on a bus that will seat from 12 to 15 people, which may be called a compromise between the bus in use abroad and the jitney in use here, and we will find that the space conditions on the street for each such units would be, approximately, 17 or 18 ft. in length by from 6 to 7 ft. in width. At least eight of such buses would be required to equal one modern street car, such as is used on the lines in San Francisco, and eight of such buses, and the necessary clearances between them, would take up as much space in the streets as at least three electric cars.

A city can ill-afford to permit any system of transportation to develop which will take up more space in its streets for similar service than is occupied by the surface roads, and, in fact, in our larger cities every effort is being made to divert as much of the traffic as possible to underground railways.

Apparently, therefore, the jitney in this respect is not a step in advance, and if there were no other objections this would be sufficient to absolutely condemn it.

But the economic condition is one which it is even more difficult to meet. The present electric car is the development of years and enormous sums of money running into millions of dollars have been expended in perfecting it. At the present time it is unquestionably the most efficient and economical vehicle for transporting large numbers of people over and along the streets of a city.

In order to arrive at a comparison of costs between a street car and an auto bus, we must base our comparison on some unit, such as a seat mile, and in making this comparison, I propose to include in the costs all expenses of every kind and character, including taxes, and in addition thereto a reasonable return on the investment necessary. I further propose to use the highest costs prevailing in this country for the street car and the lowest theoretical cost for the automobile.

It would appear, from an actual investigation of the different types of automobiles used in the jitney service, that the Ford has been found to be the most profitable. In other words, that this particular make of machine can be operated under the conditions of the jitney service at less expense than any other make. This assertion is based upon the fact that out of 261 automobiles, which were actually in operation in San Francisco on January 26th, 89 were Ford machines, or practically 30 per cent of the total number. The next largest were Overlands, of which there were 35.

The present price of a Ford machine, capable of seating four persons in addition to the driver, is $565.00. To arrive at a proper charge for depreciation, I will assume that it can operate 56,500 miles before being relegated to the scrap pile, although from the experience of those who have operated Ford cars in the jitney service, they do not claim a life of even one-half of this amount. Giving the car the benefit of the longer life, however, makes the proper depreciation charge one cent per mile.

The cost of a set of tires is within a few cents of $40.00. These are guaranteed by the manufacturer to have a life of 3500 miles, but, for the purpose of this estimate, we will assume a life of 4000 miles, which, on the basis of a cost of $40.00, is equivalent to one cent per mile.

Twenty miles per gallon of gasoline is certainly a liberal allowance, and this on the basis of 12 cents per gallon, makes the cost .6 of a cent per mile.

Lubricating oil will cost, approximately, 20 cents per quart, and two quarts per 100 miles is, apparently a fair allowance. This is equivalent to .4 of a cent per mile. Miscellaneous supplies, housing, cleaning and minor repairs to the car will, on a most conservative basis, average at least one cent per mile.

Assuming the car can make an average of 100 miles per day in actual service, and that $3.00 per day is a reasonable wage to allow the driver, makes the cost for the driver 3 cents per mile.

A resume of the above is as follows:

Depreciation	1c per mile
Tires	1c "
Gasoline	.6c "
Oil	.4c "
Miscellaneous, including repairs, storage, etc.	1c "
Driver	3c "
Total operating costs	7c per mile

In this estimate extraordinary expenses resulting from accidents have not been taken into consideration, nor has there been any allowance made for injuries to persons and property, which are bound to occur.

It would appear, therefore, that the total operating costs as given above, viz., 7 cents per mile, are certainly as low as can be hoped for under the existing conditions of the art. Dividing this 7 cents by the passenger seating capacity, viz., 4, gives a cost per seat mile of 1¾ cents.

Without going into all of the details which make up the cost of a seat mile on a street railroad, I will state that in San Francisco, where the cost of operation is as high, if not higher, than in any city in the United States, and including in such cost a reasonable return on the investment, it is, approximately .7 of a cent on cars furnishing fifty seats. In other words, the cost of a seat mile in the jitney service is at least 2½ times the cost of a seat mile of an electric car. If the comparison was based on the carrying capacity of the two types of vehicle, a considerable larger discrepancy would be found to exist. As a matter of fact, the gross earnings per seat mile of the street cars now operating in San Francisco are less than the actual operating costs per seat mile of a jitney bus exclusive of any allowance for the driver's wage.

Under similar requirements of service, it would, therefore, appear that the street car has absolutely nothing to fear from the competition of the jitney bus, but unfortunately for the street car, it has been compelled up to the present time to compete with an absolutely unregulated service, and under handicaps which are most inequitable.

In the first place the burdens of taxation are far heavier. Directly and indirectly, the street railways of California pay on the average taxes amounting to at least 12 per cent of their gross receipts. Assuming the earnings of a jitney bus are simply equal to the minimum operating expenses, including a living wage to the driver, the total taxes to the state, city and county, including all licenses, only amount to approximately 1¼ per cent.

In the second place, the jitney bus is not required to adhere to any specified route. It furnishes no transfers, but confines itself entirely to the short haul travel, or what might be termed the cream of the business.

Governmental authorities, recognizing that a transportation system in any city is a natural monopoly, have required street railroads to furnish transfers to enable people to reach any point within the corporate limits, and oftentimes beyond, which are tributary to its system, upon the payment of a 5 cent fare. This means that a considerable number of the passengers are carried from 5 to 10 miles, or even more in some instances, and the street railroad actually loses money on this class of business, which has to be made up from the profit of the short haul travel.

No one factor in the development of American cities has had more influence than the system of a flat street car fare. It has enabled the working man to acquire a home in the suburbs, where real estate can be acquired at reasonable cost, and has eliminated the congestion so common to the cities of the old world, where the transportation systems have been developed on the so-called zone system.

If the American people decide to forego the present advantages derived from the flat rate, and permit the street railroads to establish zone systems, charging the passenger a rate in proportion to the distance traveled, competition from the auto bus will soon be eliminated.

To illustrate, I will assert without fear of contradiction, that a passenger can be transported on the street cars in San Francisco, from the Ferry to 18th and Castro streets, to which point the largest number of the jitney buses are at present operating, at the rate of 2½ cents and still earn a reasonable return on the investment, but under such conditions the fare to the outlying districts would have to be considerably in excess of 5 cents, and the operation of many of the existing lines entirely abandoned. The logical and inevitable results which would surely follow from the adoption of any such zone systems of fares would be the building of large apartments and tenements in the downtown district in close proximity to where the workers are employed.

There is just one other matter which I desire to refer to briefly, viz., the increased hazard to life and limb to every one using the streets of a city where the jitney bus is operating. What this increased hazard amounts to can be roughly estimated from the fact that in London, England, during the year 1912, the deaths caused by motor buses exceeded in number the deaths caused by all vehicular travel of every description in London during the year 1905.

It can further be illustrated by the record of the traffic squad of San Francisco's police department, which shows that during the month of November, 1914, there were five automobile accidents in the district policed by that branch of the service with but one person injured. During the month of December,

1914, there were five automobile accident in the same area and one person injured, while during the month of January, 1915, up to and including the 26th, there were 18 automobile accidents, with 11 persons injured, one of which resulted in the death of the injured party. It, perhaps, is needless to add that prior to January 1st there were practically no jitneys in operation in San Francisco.

The savings of a large number of our fellow citizens have been invested in the street railway industry, probably to a much larger extent than is generally recognized. For example, in the case of the United Railroads, out of a total of approximately $40,000,000 in bonds outstanding, $25,000,000, in round figures, are owned within the state of California, and, of course, by far the larger part of this amount is owned in San Francisco.

These twenty-five millions are distributed among two thousand five hundred people, many of whom are dependent upon the income derived from these investments.

Is it just or wise from any point of view to depreciate these large investments by encouraging an unregulated industry to compete on such unequal terms with an old established industry, which has spent large sums of money in developing its business, and through which the cities of our country have been able to expand in a manner unprecedented in the history of the world, and especially when we take into consideration the fact that the cost of service under anything like similar conditions makes the permanent existence of the jitney an economic impossibility?

The electric railroads, both urban and interurban, do not ask for any privileges or advantages withheld from their automobile competitors, but they do demand that the same conditions of service, the same burdens of taxation, and the same protection to the traveling public be demanded of their competitors as they are required to operate under.

Under equal conditions, the cost of service will unquestionably be the controlling factor, and the road to Tipperary for the jitney bus is still a very long one.

EFFICIENT POWER PLANT MANAGEMENT

TABULATING MACHINES FOR CORPORATION ACCOUNTING AND STATISTICAL WORK.

BY E. A. WEST.

[Concluded.]

Treasury Department.

The work done for the treasury department consists of making up lists of railway trainmen, light and power employes and printing same on regular pay rolls twice a month. This is done by the addressing machine already mentioned.

The pay rolls give the name of the man, his occupation and his rate; from the information punched on the card, it is possible to check the total time of each man and automatically make a distribution of each man from the distribution punched on these cards. By this scheme we are able to get a correct check of the total amount due the man, because from the tabulation of the time cards, we obtain the total number of hours, days or other units of time worked by each person, and by a quick comptometer calculation can figure the amount due. This is accomplished by multiplying the units of time by the rate; this amount should check with the total amount in dollars and cents shown by the total of all of the tabulating machine cards for each employe.

Job Orders.

As job orders are completed, completion slips are forwarded to the cost department, and the tabulating bureau is notified to make up a cost statement covering the job. These come through promptly and are referred to the proper department heads for their information.

There is no use going into a discussion of the value of cost statistics, as I believe all engineers appreciate their importance. I might say that one of the greatest uses to which we have put the tabulating department to is in making up completed job cost sheets as soon as a job is finished. One of the main difficulties in getting completed cost information heretofore has been that in the ordinary run of auditing department routine work, there has been so much congestion at the month-end closing of the general books, that completed work orders and estimates were ignored until time was available to make them up. The consequence was that we would be from 18 to 30 days behind in getting cost reports. I am glad to say, under the tabulating system we are enabled to get reports out within a week after a job is completed, and sooner than that as a usual thing. A cost report with the job still fresh in the mind of the man who did the actual work is of great value in planning and estimating on new work inasmuch as the executive can better control the operation of the particular department concerned.

One of the greatest bugbears in cost keeping has been the difficulty that cost accountants have had in making their figures agree with the general accounts. Using the tabulating card for accounting and cost work combined, punching the job number, operation number, and account number on this same card for any amount, it is obvious that the cost figures must agree with the accounting figures because if any amount should happen to be passed or lost in the accounting records, it would certainly not show up in the cost record, and it would therefore be impossible for the accounting record to balance with the cost record—likewise it would be impossible to balance out with the general account totals and q. e. d., the wheels stop until the obstacle is removed.

The manner in which the tabulating machine is applied to the work order system of the company is probably as good an example as I can give of a specific case, and especially one that will be intelligible to engineers. At the time it was decided to put the cost work through the tabulating room, it was neces-

sary to design a card to take care of the pay roll charges for the various operating and construction general ledger accounts. These cards also had to show the job order numbers and an expense classification. A labor, team and automobile and material card were especially designed for the purpose. After the employes' time has been approved by the foreman, an especially arranged time sheet is turned over to a time clerk, who extends on the time sheet the amount earned by each employe, also extending the various amounts earned by all of the employes against each job number. These time sheets are then turned over to the tabulating department operator who perforates a card for each employe and account charged. The cards are then run through the tabulator to ascertain the total amount of the pay roll. This amount is then checked against an adding machine list made up from the totals resulting from the time sheets extensions. At the end of each pay roll period, cards are assorted to operating accounts, jobs, team and automobile expenses. Each one of these groups is further assorted to account numbers or job numbers, and the cards for each account number or job number are run through the tabulator in order to arrive at the total amounts chargeable to each. The information thus obtained is listed and reported to the auditing department. The totals to each job order, subdivided to expense classification, is also reported to the cost clerk, who posts this information on the individual job sheets.

Under the method that previously obtained there were so many accounts, jobs and estimates in use that the distribution by hand became a cumbersome process and considerably slower to operate. Under the present method we are able to get our distribution out more quickly and as a whole, effect a considerable saving in time that previously elapsed before reports were forthcoming on completed jobs.

Claim Department.

The claim department makes use of the tabulating machine to gather statistical information relative to accidents. Every accident reported is given a file number which is used throughout the time of investigation and settlement of the case as an identification number. The cards are punched for this number, and in addition:

(b) The division of the company's system in which the accident occurred.

(c) Class of accident, a code system having been arranged to cover this.

(d) The car line, power plant, or other place at which the accident occurred.

(e) A settlement, (if any).

(f) Expenses of claim department, legal department, hospital, witnesses, court fees, etc.

General.

The work outlined in the foregoing comes out monthly, semi-monthly or weekly. A daily report is made up also, and comprises information for an earnings chart which shows day by day the cost of operating the light and power department from the first of each month—this curve is plotted together with an earning curve. The latter is calculated daily from data obtained from the statistical department. In other words, the Portland Railway, Light & Power Company has kept its records for a sufficient length of time to be able, taking into consideration the amount of energy generated the day before, to approximate the earnings for each day. I might say that this method has been used for over a year and has run within 2½ to 3 per cent of the actual earnings taken from the auditor's books after the close of the month's business, close enough for a daily guide as to what the company is doing.

The greatest value of the punched record is that of expediency when certain information is wanted in a hurry. Long runs and detailed information can be obtained readily that ordinarily would take months to compile, or else would be so costly as to be prohibitive. To again quote from Mr. Schmidte's paper:

The tabulating system can be used in connection with original property records. For example, we have for each meter, a card showing the date received, make, style, wire, type, constant, date when the meter goes into service and when installed. And when the meter is finally condemned, a notation is made on the card. There is no reason why a great deal of this information cannot be perforated on a tabulating card, and the card filed away to take care of this. Hollerith cards can also be used in compiling an inventory and valuation of the overhead distributing system, information concerning poles, transformers, wire, insulators, arc lamps, etc., can be punched in detail on tabulating cards and the same filed as original records. If any doubt ever arises as to the order in which they are filed, it is a simple matter to run them through the sorting machine and have them come out in their proper order.

In this day and age of utility regulation, those companies located in cities where various commissions have jurisdiction, receive frequent requests for data regarding all phases of their business. Most of the reports asked for come from the same original source, but hardly any two requests ever require data arranged and compiled alike. In such cases the tabulating machine proves its greatest worth and if tabulating machine cards have been used to record a great part of the company's activities, the expense and drudgery incident to detailed tabulations will be reduced to a minimum.

Filing Cards.

There is one other feature that I have failed to touch upon in this paper, and that is the matter of filing. There is such a vast number of cards accumulating that their proper filing requires a great deal of attention. The problem has been solved by using heavy cardboard boxes, placed on shelves, spaced close together. The record of the contents of each box is made on the front end of the box.

There is, of course, a limit to the application of the Hollerith tabulating machine, and I would not recommend that it be used for any information that is so simple in its nature that its make-up and use can be termed "single purpose" and that is readily tabulated by an adding machine. The tabulating machine finds its broadest scope and application where the information recorded is to be used for diversified purposes.

INDUSTRIAL USES OF FUEL OIL

BY F. B. DUNN.

Oil and the Glass Industry.

(Continued.)

Window glass is always blown. It is usually a soda-lime glass, and the batch is melted and refined in the usual manner, either in pots or in tanks. After refining, the glass is allowed to become pasty and then the blower begins his work. His chief tool is the "pipe," a straight piece of iron tubing four or five feet long, usually provided with a mouthpiece. He dips the pipe into the soft glass, which is called "metal," and gathers a lump on the end. Then, by blowing through the pipe, while whirling it between the palms of his hands he forms a hollow globe of glass. This is re-heated in a special furnace called a "Glory-hole,"

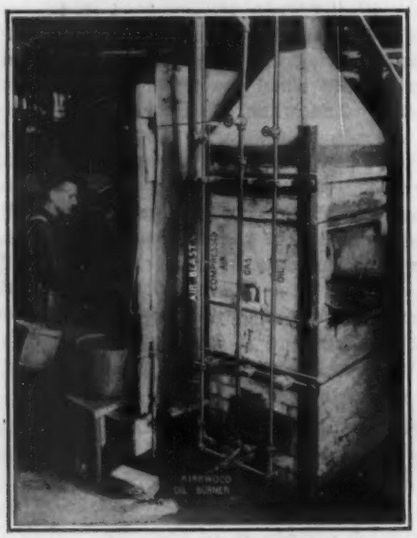


Fig. 55. Kirkwood Burners in "Glory Hole" at Heinz Bottle Works.

(Fig 55), until soft, rolled on a flat surface, and then swung in a vertical circle, with occasional blowing through the pipe until the globe has elongated into a hollow cylinder, closed at one end and opening into the pipe at the other. In order to have plenty of room for the vertical swinging, the workman stands on a

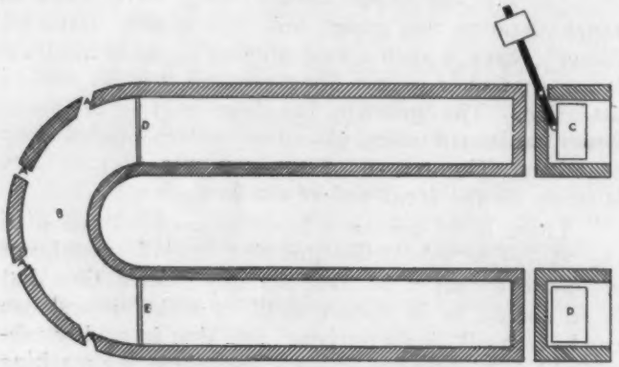


Fig. 56. Annealing Furnace for Blown Ware.

plank or bridge placed across a rather deep pit. The closed end of the cylinder is reheated until soft, and then blown out; the small opening thus made is enlarged by means of the widening tongs. The pipe is detached by touching its point of attachment with a wet stick, and the edges of the still soft glass are trimmed with shears. A hollow cylinder open at both ends is thus formed, and is cut lengthwise with a diamond. It is then put into the flattening furnace, in such a position that the cut is on the upper side. The heat being sufficient to soften the glass, the cylinder slowly opens and spreads out on the floor of the furnace in a flat sheet. It is then transferred to the annealing furnace for blown ware (Fig. 56). This consists of a long oven, heated at one end and cool at the other. A system of endless iron bands carries the glass from the hot to the cool end of the oven. Sometimes the glass tube to be annealed is placed on a large horizontal table, usually built of slabs of stone, and carefully balanced so as to revolve easily and slowly by means of a gear, while the segment passes through a narrow opening in the side of the flattening furnace, where it is exposed to the high temperature. The glass is thus slowly carried out of the furnace into a cooler compartment from which it is removed when nearly cold. The table is chiefly used for window glass.

The glass sheets are now cut into marketable size without any polishing. Since the surface of blown glass is fused and not polished, it is brilliant and hard. Consequently it is less easily scratched or etched and is more durable than plate glass when exposed to the weather.

Glass blowing is an exceedingly fatiguing labor, and only men of strong constitution and good lungs can do it. The mass of glass which a good workman will handle at one time, averages about 18 pounds, and from it he will form a cylinder over a yard long and a foot in diameter.

Pressed glass is made by the use of a die or mould; these moulds are quite expensive, but owing to the great number of pieces of the same form and design that are made with slight labor, pressed ware is fairly cheap.

"Tough" or **"tempered"** glass is produced by a special method of annealing, the articles so treated being capable of withstanding blows and sudden changes of temperature. This tempering is done by plunging the article, while still so hot as to be somewhat soft, into a bath of oil heated to 100 deg, to 300 deg. C. This sudden "quenching" hardens the surface of the glass but causes internal stresses. If scratched or cut slightly, toughened glass is very apt to fly to pieces, sometimes with great violence. And even after standing a long time, spontaneous fractures often occur. It is mainly used for lamp chimneys.

A process for making hardened glass plates and window lights is employed in which cold metallic surfaces are applied to the glass plates while the latter are still plastic. The sudden chilling imparts an exceedingly hard surface to the glass, so that it can be used in exposed situations, as in street lamps.

Glass making may seem simple, but great skill is required on the part of the workman. This is especially true in the manufacture of bottles by the old method described above. There are bottling machines which are entirely automatic, the siphoning of the molten glass being accomplished by means of a vacuum, the molding by an automatic process, and the blowing by compressed air. Only one operator is required and he merely removes the bottles as they are made.

A glass factory using oil as a fuel will now be described. The glass furnace as shown in Fig. 57 is called the regenerative type of furnace; in it, the air for combustion passes up through one flue to the combustion chamber, through the furnaces, and down through the other flue. Thus the inlet chamber, which is made of checker-work brick, imparts its heat to the incoming air, while the escaping gases are heating the checker-work brick in the other chamber. The air is reversed at intervals of twenty minutes. Thus the air required for combustion is always well heated. The oil is fed by means of a pumping system installed by the Tate-Jones Company. The oil burners were designed by the same company, and use compressed air at 40 lb. pressure to atomize the oil, which is supplied at a temperature of 140 deg. F. and a pressure of 40 lb.

Three weeks are required to bring the furnace illustrated up to its proper working temperature, in order to prevent cracking of the walls as a result of uneven expansion. The finely ground raw materials, together with some broken glass are then introduced until the capacity of the furnace is reached. When the "batch" reaches its "fusion" point, 2500 deg. F., the temperature of the furnace is raised to 2700 deg. F.

"Floaters" of fine clay are held in place by the current of melted glass flowing towards the revolving tank. The liquid passes under the floaters, which skim off the impurities that have arisen from the "batch" during the melting and refining process. This leaves the glass in the revolving tank with a clean surface, free from bubbles. The temperature of the revolving tank is much lower than that of the main tank.

The molten glass is taken by the "bottle machine," and made into bottles. The bottles are then passed through the annealing furnace, Fig. 56. They enter at the door C, and by means of an endless chain gear are carried to D where they pass to a revolving table and are conveyed through B. This is the hottest part of the furnace, usually heated to 1200 deg. F. It will be observed that the bottles come into direct contact with the flame at this point, and when removed are quite clean, excepting for a cloudy film. It was first thought that this film was caused by poor atomization of the oil. The chemist made some observations and stated that it was not an oil soot, but some unknown composition possibly due to the vaporization of the water in the oil. This film is readily removed by wiping with a damp piece of cloth. At E the bottles are again passed to the endless chain gear and pass out the door F. This operation requires about 36 hours. The bottles are then examined, cleaned, and packed for shipment.

It is estimated that about six tons of bottle glass are melted and refined in this furnace with an oil consumption of 840 gallons barrels, or 140 gallons of oil per ton of glass. Blown window glass may also be made in this style of furnace.

The common pot furnace is used by some of the smaller manufacturers. It is similar in construction as the crucible steel furnace shown in another part of this book. A small special furnace called the "glory hole" is also used in many factories for the purpose described in making window glass. There are also small square furnaces about 18 in. x 18 in. x 24 in., inside dimensions. The flame passes down through the top to a combustion chamber, and the heat of the flame passes over into the furnace. Such a furnace is kept at a low white heat. In some glass factories, small furnaces are used to dry the sand and to prepare the limestone. Air is almost universally used for atomizing the oil.

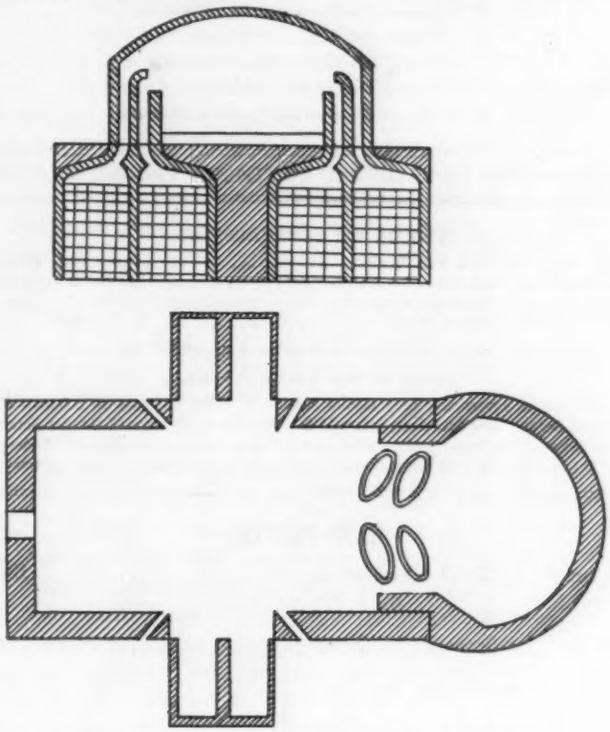


Fig. 57. Regenerative Type of Glass Furnace.

Many large glass factories are now using fuel oil because of its cleanliness, in spite of the fact that it costs more than other fuels. The flame comes in direct contact with the glass without producing any discolorization or deterioration and the temperature may be maintained absolutely uniform, thus saving many articles formerly ruined by the fluctuations in temperature caused by unsteady firing.

[To be continued.]

Service requirements for electric light and power companies have been carefully studied by the U. S. Bureau of Standards as a guide for municipal or state public service commissions. The principal factors are quality and reliability of service and accuracy of meters. The extent to which automatic voltage regulators, voltmeters recording continuity of service, pressure wires, and instrument and meter-testing outfits can be used by small companies without undue hardship is also receiving due consideration.

JOURNAL OF ELECTRICITY
POWER AND GAS

FOUNDED 1887

PUBLISHED WEEKLY BY THE

Technical Publishing Company

Crossley Building, San Francisco

E. B. STRONG, President and General Manager
A. H. HALLORAN, V. P. and Managing Editor
A. M. HUNT, Treasurer and Special Contributor
C. L. CORY, Secretary and Special Contributor
ROBT. SIBLEY, Director and Special Contributor

ON LIBRARY CARS OF ALL SOUTHERN PACIFIC TRAINS

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico	per year,	$2.50
Dominion of Canada	" "	3.50
Other Foreign Countries within the Postal Union	" "	5.00
Single Copies, Current Month	each	.25

NOTICE TO ADVERTISERS.

Change of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

CONTENTS

Sporadic Insulator Troubles 121
By P. M. Downing.

Methods of Stream Measurement 123

Potash from Feldspar 123

The Jitney Bus 124
By Chas. N. Black.

Tabulating Machines for Corporation Accounting and Statistical Work 126
By E. A. West.

Industrial Uses of Fuel Oil 128
By F. B. Dunn.

Service Requirement 129

Editorial 130
Census Figures.
Overhead Structural Costs.
The Jitney Contractor.

Personals 132

Meeting Notices 132

News of California Railroad Commission 134

News of Arizona Corporation Commission 134

International Engineering Congress, 1915 134

Federal Signal Company 134

Mazda Bureau Extending Campaign 135

Trade Notes 135

Nevada Welfare and Development Meeting 135

News Notes 136

Electrical Superiority of the West

Every five years the Bureau of the Census publishes statistics of the electrical industry which make it possible to find out how big we have grown since last time. The figures for the generating equipment in 1912 have just been made public. The most significant fact developed is that the 7,642,755 kw. rating of generators in 1912 is nearly four times as great as the rating in 1902, bearing out the statement that the electrical industry doubles every five years. It is also curious that this increase in rating was accomplished with practically the same number of dynamos, there being slightly in excess of fifteen thousand machines reported for 1902, for 1907 and for 1912. This is largely explained by the six-fold increase in the rating of alternating current generators, which doubled in number while the direct current machines were correspondingly decreasing, particularly in the constant amperage type. Direct current machinery represents only one-sixth of the entire rated capacity.

Commercial plants were responsible for most of this increase, their rated capacity increasing nearly five times during the decade, while the capacities of municipal and of electric railway plants were less than three times greater than in 1902. Nearly two-thirds of the 1912 rating and also of the power generated is credited to commercial plants, one-third to electric railways and 3.1 per cent of the power generated or 4.8 per cent of the capacity to municipal plants.

The Western states have developed one-third of the hydroelectric power of the country, although only one-fourth of the country's primary power is derived from water wheels. During 1912 the three Pacific Coast states furnished one-seventh of the entire power output, this being sold at slightly more than one-seventh the total income derived from the sale of power. The states West of the Rockies furnished one-fifth of the total power. Nevada showed a percentage increase of nearly twelve times, with Idaho a close second. When it is remembered that this Western territory has but 6 per cent of the country's population this electrical development seems the more remarkable. These figures prove the contention that the West has long been doing it electrically.

Overhead Structural Costs

The difference between engineering foresight and engineering hindsight is something over ten per cent, according to figures which were recently filed with the California Railroad Commission in the San Jose rate case. The point in controversy was how much should be allowed for overhead costs in construction work, the commission holding that 12 per cent is an ample allowance and the cost data from several actual installations tending to prove that sometimes more than double that amount is not enough to cover the ratio of overhead to direct structural costs.

First it was necessary to agree as to what constitutes the overhead. In the case of the Los Angeles aqueduct, where Engineer J. B. Lippincott estimated it at 33.77 per cent, it included three main items, the

auxiliary, the miscellaneous and the general executive expense. Under auxiliary construction expense was included such items as administration, surveys and general engineering, roads and trails, power lines, and equipment, all totalling 26.22 per cent. This classification also included such items as "concrete replacement, $72,752, 1.2 per cent" and "miscellaneous losses, $88,130,' not included in other funds. Miscellaneous expense representing 2.75 per cent and general executive 5.3 per cent, brought the entire overhead up to 33.77 per cent.

In the case of several hydroelectric power plants the records show that the overhead varied from 18.02 to 26.24 per cent, this amount including interest on the investment during the period of construction. When building the Big Creek plant of the Pacific Light & Power Company the ratio of overhead to direct structural was 23.15 per cent; with the Big Bend plant of the Great Western Power Company it was 22.76 per cent, whereas the recent extension to the plant represented 20.66 per cent; various other hydroelectric plants throughout California show about the same proportion.

Almost without exception the actual cost of engineering construction is greater than the original estimate. The discrepancy is usually due to many unforseen contingencies. Temporary structures must be built to facilitate work,—telephone lines, roads and trails, railroads and tramways; extra tools are needed; the boarding house may be operated at a loss. Then again there are many unexpected delays and breakdowns. Spare men and equipment must be ready at all times. In many respects a construction force is like a baseball team where there must be twenty or twenty-five men in the squad ready to do the work of nine.

Lastly there is the item of experience and efficiency. Standard construction can be performed at a much lower cost than is required for new and special work. Particularly has this been true in the building of many pioneer hydroelectric installations where neither the equipment nor methods have been put to the test of time.

As time goes on and more records became available engineers are able to estimate more intelligently and occasionally even overestimate the cost of a job. though under-estimation is the rule. Considering the well known tendency to under-estimate the average opinion of the cost to reproduce a power system is more likely to be low than high. Consequently great interest attaches to these figures of overhead cost in construction and in making valuations account should be taken of the difference between engineering hindsight and foresight.

The "Jitney" Contractor

One of the fundamental principles of American government and business is the policy of "live and let live." This land of opportunity has prospered by encouraging initiative, ambition and enterprise. Consequently, when the little man or the young man makes a start he is extended every help. But when sharp practice, unfair means and parasitical methods are employed, some restriction is necessary to protect society against the unscrupulous.

A glaring example of ignorance and unfair methods in the electrical contracting business is afforded by the irresponsible individual with his office in his hat and his equipment on his back who takes contracts at such a low figure that no legitimate contractor can compete. All that has already been written and said about this unfair method of competition can be admirably summed up in the term "jitney contractor." Thus do new manners point out the folly of old ways.

The jitney contractor is frequently an indifferent workman who for good cause has been let out of the employ of some contracting concern where he learned the little that he knows. In order to get revenge on his former employer or as a means of eking out a precarious existence he visits former patrons and submits low bids on work to be done. As he is content to work for day's wages and as he is ignorant of the true costs, his bid is so much lower than that of an established concern that he is awarded the contract. When he comes to do the work he may find that he forgot something in his estimate and is compelled either to "skin" the job or give up before it is completed. While this case is somewhat overdrawn and while there are many honest, capable and worthy curbstone contractors, it is necessary to cite the possible cause in order to illustrate the probable effect.

In the words of the poet the customer of the jitney contractor well may say

> "Of all sad words of tongue or pen,
> The saddest are these, I'm stung again."

It would be bad enough if such only were the case, and if one "jitneyized" customer, like the burnt child, would hereafter know better. But the actual effects are far more far-reaching. Not only does the customer get a poor job with no chance for redress against an irresponsible "fly-by-night," but the legitimate contractor is cheated out of a profitable job, his equipment and men are idle, his overhead continues, and the next job must pay the bill. If there is no next job the contractor fails, the jobber is embarrassed and the manufacturer loses. Like the ever-widening circles from a stone dropped in a still pond, the jitney contractor hurts not only himself but disturbs the entire industry.

Several remedies have been suggested as a cure for this recognized evil. Protection to the customer can be insured by a municipal or state license guaranteeing the ability and responsibility of the contractor.

Protection to the legitimate contractor and to the man who sells to him can be afforded by a close scrutiny of credits. Credit has frequently been extended to what was known and subsequently proved to be a poor risk. Before the agent from whom a contractor gets his supplies gives credit, he should at least satisfy himself that the particular job for which they are to be used has been figured so as to insure a fair margin of profit.

But as there is always some new short-sighted backer of each new jitney contractor, each filling the ranks of those who have failed and dragged down the whole industry by failing, the only way by which a permanent cure can be effected is by education. If the architect, builder and owner understood the facts in the case, if the man who sells the supplies appreciated the risk, and if the contractor developed his business by fair means and was not a parasite living at the expense of others, there would be no jitney contractor.

PERSONALS

Clark Van Fleet, an electrical contractor of Santa Rosa, Cal., was a visitor to San Francisco during the week.

C. R. Humerick of the F. E. Newberry Electric Company, Los Angeles, is spending a few days at San Francisco.

P. H. Annis of Puyallup, Wash., has been elected president and manager of the Puyallup Farmers Telephone Association.

William Fouch and **Mont Fouch** of the Western Electric Works, Portland, Oregon, are visiting the Exposition at San Diego.

F. J. Taylor of Sunnyside, Wash., has been re-elected president and general manager of the Sunnyside Telephone Company.

W. D. Peaslee is now connected with the Department of Electrical Engineering, Oregon Agricultural College, Corvallis, Oregon.

C. N. Beebe of the Canadian Westinghouse Company, Limited, with headquarters in Vancouver, B. C., was a recent visitor at Seattle.

J. H. Seaver has resigned as superintendent of the Great Shoshone & Twin Falls Water Power Company at Twin Falls, Idaho to engage in farming.

W. D. Thomas, salesman for Electric Railway and Manufacturers' Supply Company, San Francisco, returned during the week after a business trip through the southern part of the State.

Charles E. Warner, consulting engineer at Portland, has been appointed First Tribune of the Jovian Order for that city and has already taken active steps to organize a Jovian League.

Tom E. Collins of the Pacific Electric & Manufacturing Company, has been appointed First Tribune of the Jovian Order at San Francisco. Among other things he is planning for a large rejuvenation during the annual convention of the National Electric Light Association.

Charles E. Poyer has been appointed assistant general sales manager of the Edison Storage Battery Company at Orange, N. J., thus enabling **Wm. G. Bee,** vice-president and general sales manager, to give more of his personal attention to the advancement of the electric vehicle field.

Fred Goldman, a graduate of the University of California, has been elected as instructor of physics and electrical engineering in the Portland Trade School. Mr. Goldman has been until recently foreman of one of the test departments of the General Electric Company at Schenectady, N. Y., and resigned this position to accept the above position.

D. G. Rosenblatt, special representative of the industrial and power department of the Westinghouse Electric & Manufacturing Company, with headquarters at Salt Lake City; **L. C. Lamotte,** manager of the Butte, Mont., office of the company, and **C. L. Wernicke,** manager of the Portland, Ore., offices, have returned from a meeting at the Seattle offices of the company.

J. P. Lippincott, engineer with the Los Angeles aqueduct, has been awarded the James R. Croes Medal of the American Society of Civil Engineers for his paper entitled "Tufa Cement, as Manufactured and Used on the Los Angeles Aqueduct." **H. T. Cory** consulting engineer at San Francisco, was awarded the Thomas Fitch Rowland Prize for his paper entitled "Irrigation and River Control in the Colorado River Delta."

Frank Webster, who recently succeeded C. H. Robertson head of the Central California Traction Co. at Stockton, has announced a number of appointments to executive positions. Important among them is the assignment of **E. L. Stern** to the office of traffic manager, a position he has been filling for the past three or four months. He was formerly industrial agent. Other appointments are: **H. E. Jackson,** trainmaster; **H. C. Smith,** auditor; **W. P. Neville,** general agent in Sacramento; **M. J. Ferry,** freight agent at Lodi; **B. H. Ford,** freight agent at Stockton.

MEETING NOTICES.

Independent Telephone Association of Washington.

The representatives of 25 telephone concerns met recently at Seattle, Wash., and formed the Independent Telephone Association of Washington. Officers elected were: J. M. Wilson, Seattle, president; C. J. Farmer, Port Angeles, vice-president; John King, Puyallup, secretary. The association was formed for the purpose of permitting companies to meet all problems of the industry with co-operative effort.

Electrical Development and Jovian League.

The regular weekly luncheon of the San Francisco Electrical Development and Jovian League was held at the Poodle Dog on February 3d with an attendance of 107, President F. H. Leggett, presiding. As chairman of the day C. C. Hillis had provided a high class musical entertainment which was greatly enjoyed. He then introduced Mr. Chas. N. Black, vice-president and general manager of the United Railroads, who gave an interesting address on the jitney bus, as published elsewhere in these columns. At the conclusion of this address, on motion of H. V. Carter, the league extended Mr. Black a vote of thanks and unanimously endorsed his stand against the jitney.

Jovian Electrical League of Southern California.

Rejuvenation week of the League, an event of considerable importance to the electrical fraternity of Southern California, included a most enjoyable luncheon at Christopher's on February 3, which was attended by about 130 Jovians and was ably presided over by J. E. Baker, engineer of the board of public utilities. Tribune Pieper welcomed Thos. S. Foulkes back as a member, as he had left the order several years ago, when he assumed the duties of president of the board of public utilities. Three-minute talks were made by C. E. Spaulding on H. F. Anderson, and Harry W. Harrison on H. C. McCutchan. Splendid vocal selections were rendered by the comedy trio, Rogers, Stewart and Roache. This was followed by a talk on "High Voltage in Municipal Management," by Jesse D. Burks, director of efficiency department city of Los Angeles. After pointing out, by means of charts, the inefficient methods of procedure employed by the city, he fixed the blame on the charter and urged a speedy and complete revision of the same. What is needed, he said, is intelligent planning and then efficient execution of the plans. The plan should embody the views of many persons of experience, but the execution is dependent solely on the ability and efficiency of one man. What we need, above all, is an intelligent citizenship and not a complaining one, citizens who make their wants and patriotism known at all times and not only on the fourth of July.

Oregon Society of Engineers.

The annual meeting of the Society was held on February 1, with an attendance of 80 members and guests, President W. H. Graves, presiding. W. J. Turner was elected president for the ensuing year; J. C. Stevens, vice-president, and O. E. Stanley, secretary. R. S. Edwards, P. L. Campbell and J. R. Thompson were elected as directors. The constitution was amended so as to admit honorary members and to change the method of handling applications for membership.

The legislative committee made a report on the bill before the legislature consolidating the state engineer's and

the state highways engineer's offices. The committee favored the consolidation, but thought there should be a nominating committee provided to choose a suitable and competent engineer, made up of the President of the Senate, Speaker of the House, President of the University of Oregon, President of the O. A. C., chairman of the local section of the A. S. C. E., President of the Oregon Society of Engineers, President of the State Grange; this committee to nominate two candidates, and it being necessary to obtain a majority of the votes of the committee for nomination. The governor to appoint from same if he desires. The salary to be $5000 and the candidate must be a professional engineer of experience.

The entertainment of the evening consisted of selections by the electric orchestra, policemen's quartette; Mr. Henkle sang several songs accompanied by his wife on the piano. Monologues and stories by Mrs. Hogan, late of the Orpheum circuit, and an amateur boxing match. Also Mr. C. E. Warner gave a talk entitled "Sparks, Fuses and Cut-Outs," urging co-operation with the Jovian Order.

Mr. Ed. Werlein, special agent for the Portland Railway Light & Power Company, acted as toastmaster after the business session was concluded.

The meeting was a smoker and strictly informal. The members and their guests grouped themselves about tables and enjoyed corn-cob pipes and tobacco, also a buffet lunch was served.

Portland A. I. E. E. and N. E. L. A. Section.

The regular monthly meeting of the Joint Sections was held Tuesday evening, February 2, in the auditorium of the Journal building. Mr. G. M. Barker, presided over the meeting and Mr. C. E. Warner made a short talk on the proposed organization of the "Local Jovian League." His plea was "co-operation for mutual benefit." The paper of the evening was read by Mr. R. R. Robley on "The Load Dispatching System of the Portland Railway, Light & Power Company." This paper described in detail the system employed for load dispatching used by the P. R. L. & Pr. Co. A 22 circuit Kellogg telephone switchboard is used by the dispatcher, which is connected by direct lines with the three hydraulic and five steam plants and also ten substations. Duplicate lines are available over the Pacific Telephone & Telegraph Company system. The first consistent effort to put in a dispatcher system was started in April, 1912. Before this only 600 volt signal bells were used with code signals. The dispatcher now occupies an office on the sixth floor of the Electric Building, where he has diagrams of all circuits, testing apparatus and pilot lights to aid him in his work. Every operation is kept track of by a system of tags and plugs so that memory is not relied upon. Also complete log system of records are kept by the dispatchers.

It is also possible to kill all overhead feeder systems in the fire limits, if it is necessary when a fuse is burning in this district. The chief of the fire department has a duplicate diagram in his office and can call for any section to be cut dead.

Mr. Merwin of the Northwestern Electric Company described the use his company is making of a wireless telegraph set between Portland and the White Salmon plant. His company are pioneers in the use of wireless in the Northwest for this purpose.

The meeting March 2 will be entertained by a paper on "Safety First," which will be illustrated by lantern slides.

Los Angeles Electric Vehicle Association.

The regular monthly meeting of the Los Angeles Section of the Electrical Vehicle Association of America was held February 3, 1915, at the Jonathan Club, with Chairman J. Harry Pieper presiding, and an attendance of 29 members and guests. R. H. Morris presented a detailed report on the Milburn light electric. Ralph C. Hamlin, who has lately taken the agency for the R. & L. electric for Southern California and has just returned from a trip to the R. & L. factory in Cleveland and through the East, gave a short talk on business conditions as he found them and a descriptive talk of the Chicago automobile show. C. B. Criddle, general agent of the Southern Sierras Power Company, Riverside, California, a new active member, talked on the necessity of charging facilities throughout Southern California and promised that his company would co-operate to the fullest extent toward the establishing of a continuous chain of charging stations. Harry N. Sessions, commercial engineer of the Southern California Edison Company, a pioneer in the electric vehicle business on the Pacific Coast, gave an impromptu talk and read a paper on "Storage Batteries" written in his well known humorous vein.

The Membership Committee submitted application for Associate Membership of Frank A. Pim, proprietor of San Pedro Street Garage, Los Angeles. Mr. J. O. Case, chairman Garage Committee, had a meeting of his committee just previous to the regular meeting and read a report as to charging conditions in Southern California. Since the last meeting, several charging stations have been installed and his report showed that two more would be installed before March 1st, leaving but one short gap between Los Angeles and San Diego which will doubtless be shortly filled, thus giving a complete chain of charging stations between Los Angeles and San Diego, which will give electric car owners an opportunity to drive in their machines to the San Diego Exposition, feeling sure of proper charging facilities along the line. It was unanimously voted to change the regular meeting night from the first Wednesday to the second Tuesday of each month, still holding meetings at the Jonathan Club.

Los Angeles Jovian Rejuvenation.

The initial rejuvenation of the league under the present administration, carefully planned for weeks and executed with enthusiasm and dignity, was held at Hamburger's Los Angeles, on Thursday evening, February 4. It was a personal triumph for those who conceived the general plan, a credit to those who participated in the various functions, a source of gratification to the officers of the League and an evening of supreme pleasure to the 200 Jovians who attended the exercises. These were started at 7 o'clock in the banquet hall and consisted of the rejuvenation exercises proper, presided over by Tribune J. Harry Pieper, in the role of Jupiter. The members of the degree team, who accredited themselves most worthily, appeared in tuxedos and had carefully studied and rehearsed their parts, which was greatly appreciated by those witnessing the ceremony, as well as the candidates. Those taking part, besides Harry Pieper, were: W. J. Geary, Neptune; A. E. Morphy, Pluto; Henry Holland, Vulcan; J. O. Case, Mercury; Parker Reed, Apollo; W. L. Graves, Hercules; G. H. P. Dellman, Mars; W. R. Rath, Avrenim; Jas. R. Rogan, Chief of Imps, assisted by a number of cleverly acting and dressed Imps. The chairman of the degree team was Ralph Clapp, to whom much credit is due, but early and most favorable mention should be made of the committee of arrangements, consisting of the very able and hard working chairman, C. M. Bliven, J. G. Pomeroy and J. N. Colkitt.

After a number of out of town and prominent local Jovians had addressed the "conclave," among these being H. T Matthew, Mr. Monahan of Canada, F. Raymond, Pot. 316, and H. H. Cudmore, Pot. 198, the assemblage adjourned to the Forest of Argonne, as the large enclosure, surrounded by dozens of large pine trees, was termed, to enjoy a sumptuous buffet meal and "Arizona" punch served by H. J. Kister, dressed as Keupie. Others who amused the crowd were A. S. Glasgow, as a clergyman; J. M. Morris, as policeman; Z. H. Sherart, as an Indian; J. F. Rogan, as an Irish lady, and R. H. Monohan, as a Chinaman, who sang a perfectly natural Chinese ballad. Then followed the real, live entertainment, provided by C. W. Leonard, consisting of Egyptian dances by Zelda Le Claire and La Belle Rena, Queen of the Orient; songs by Bessie de Lytsch, four singers from Ethiopia, and songs by the Cornack Brothers. It was well toward midnight when the members and

their friends, who had been so delightfully entertained, most unwillingly strolled out of the Forest.

The folowing candidates were rejuvenated:

Harry Chapin Barnard, F. E. Newbery Elec. Co.
Carl Dold, Benz, Pacific Lt. & Power Corp.
Claude Everett Cayot, General Electric Co.
C. W. Comegys, Westinghouse Elec. & Mfg. Co.
Wm. Allen Cory, Otis Elevator Co.
Arthur Brittan Cram, Southern Cal. Edison Co.
C. Allison Creighton, F. E. Newbery Elec. Co.
Harry Whiting Dennis, Southern Cal. Edison Co.
Walter Harbaugh Dorrance, Southern Cal. Edison Co.
L. Woodward Drake, J. A. Roebling's Sons Co.
Thomas Harvey Dukelow, Southern Cal. Edison Co.
Harold English, Pacific Coast manager Buffalo Forge Co.
Henry Arthur Fanslow, General Electric Co.
Alfred Stevens Glasgow, Asst. Local Mgr. General Electric Co.
Frank A. Green, Southern Cal. Edison Co.
A. Victor Guillou, Pacific Lt. & Power Corp.
John Townsend Huntington, Southern Cal. Edison Co.
Herbert Francis Keenan, Asst. Treas. Southern Cal. Edison Co.
Harold Everett Kloeckner, Langstaff & Kloeckner.
William Edgar Langstaff, Langstaff & Kloeckner.
Fred Geo. Lasher, Pr. Salesman Southern Cal. Edison Co.
Louis Phillipe Lenone, Wagner Elec. Mfg. Co.
Albert Mortanson, manager Thomas H. B. Varney.
Walter Miller McKnight, Dist. Agent Southern Cal. Edison Co.
Dan Dewitt Morgan, Supt. Generation and Transmission, Pacific Light & Power Corp.
Walter Valentine Pomeroy, Treasurer Z. L. Parmelee Fix. Co.
Henry Edwin Sherman Jr., H. B. Squires Co.
Paul Adyman Shilton, Century Elec. Co.
Walter Schier, Statistician Pacific Light & Power Corp.
Roger Ray Thomas, Pres. and Gen. Mgr. Elec. Equipment Co.
Western Underwood, Treasurer Forve Pettbone Co.
George Arthur Vedder, Illinois Elec. Co.

NEWS OF THE CALIFORNIA RAILROAD COMMISSION.

The San Joaquin Light & Power Corporation has filed an application with the commission, requesting authority to issue a new series of its first and refunding mortgage bonds, to be known as Series 'C," and to bear interest at 6 per cent per annum. The company now has outstanding $2,924,000 of its series "B" bonds. These bonds bear interest at 5 per cent per annum, and it is proposed to allow the holders to exchange these bonds for the new Series "C" bonds upon payment of a premium of $100 per bond. The company also has $1,523,000 of series "B" bonds in its treasury, which it wishes to cancel and issue in lieu thereof bonds of the new series. In addition, the company requests authority to issue $136,000 of the series "C" bonds outright.

The commission has issued a supplemental order denying the application of the Marin County Electric Railways for permission to proceed with the construction of one mile of line from the Northwestern Pacific depot, Mill Valley, to the Cascades.

The commission has issued a supplemental order amending a previous decision in which the San Francisco-Oakland Terminal Railways was allowed to issue $75,000 of promissory notes for the purchase of new cars. Under the terms of the new order, the company receives permission to expend $60,000 of the $75,000 in reimbursing its treasury for moneys expended from income, provided that after such reimbursement the moneys are used for the payment of taxes falling due February 1, 1915.

The Union Home Telephone & Telegraph Corporation, operating in Southern California, has filed an application with the commission requesting authority to issue or hypothecate a sufficient number of its treasury bonds to pay for the placing of its aerial wires underground in compliance with the ordinance requirements of the cities of San Bernardino and Long Beach.

The Central California Gas Company has filed an application with the commission requesting authority to issue $6000 of its first mortgage 6 per cent sinking fund bonds at 90 per cent of their face value, and 32½ shares of capital stock at $80 per share. The company proposes to use the proceeds from the sale of these securities in partially reimbursing itself for capital expenditures in the sum of $9108.42.

The commission has issued an order authorizing the Southern California Gas Company to renew certain promissory notes totalling $66,007.89.

The commission has issued an order authorizing the Humboldt Transit Company to issue to the First National Bank of Eureka a promissory note in the sum of $20,000, to be secured by pledge of $40,000 of first mortgage 5 per cent bonds. This note, which will be executed by the Transit Company and William Butterworth as joint makers, is to take the place of a similar note of like amount previously issued by the company.

The Long Beach Consolidated Gas Company has applied to the commission for authority to issue $100,000 of bonds. The company proposes to use the proceeds to pay outstanding indebtedness in the sum of $76,000, and to issue the greater portion of the balance for additions to its plant and system.

The Santa Barbara Gas & Electric Company has applied to the commission for authority to issue $100,000 of its 6 per cent bonds. It proposes to use the proceeds from the sale of these bonds for the purpose of paying obligations to the amount of $38,000 and to expend the balance upon additional equipment and extensions.

NEWS OF ARIZONA CORPORATION COMMISSION.

The commission has granted the petition of the Globe Light & Power Company that a former order of the commission be amended so that service may be discontinued where the consumer does not pay after three notices of indebtedness have been sent, the last notice being delivered in person.

The commission has granted the application of the Magma Arizona Railroad Company to sell $165,000 in treasury stock for the purpose of raising funds to build a 35 mile narrow gauge railroad and telephone and telegraph line from the plant of the Magma Copper Mining Company near the town of Superior in Pinal County, Arizona, to Webster siding, on the lines of the Arizona Eastern Railroad Company.

INTERNATIONAL ENGINEERING CONGRESS, 1915.

The technical success of the International Engineering Congress at San Francisco, September 20-25, 1915, is now well assured. Notwithstanding the difficulties arising as a result of the present European war, the Committee on Papers is able to count on from 200 to 250 papers and reports covering all phases of engineering work and contributed by authors representing some 18 different countries. The Congress will therefore be truly international in scope and character, although the representation from the countries involved in the European war will naturally be less than originally planned.

The papers are now rapidly coming in and their character gives the fullest assurance that the proceedings will form a most important collection of engineering data and a broad and detailed review of the progress of engineering art during the past decade.

The Committee of Management is now issuing to all important engineering societies, in this country and abroad, invitations to appoint official delegates to attend the sessions of the Congress, and the presence of a considerable body of such delegates is well assured.

Membership in the Congress with the privilege of purchasing any or all of the volumnes of the proceedings is open to all interested in engineering work.

FEDERAL SIGNAL COMPANY.

Following the announcement appearing in the last issue of the Journal of the appointment of Pierson, Roeding & Co. as Pacific Coast representatives of the Federal Signal Co., it will no doubt be of interest to know that the Federal Signal Co. was founded in 1905, for the manufacture and installation of mechanical inter-lockings as used in railway signaling, and from the beginning had amongst its patrons some of the leading railroads in the United States.

Owing to the growing demand due to the use of heavy rail, the spreading out of interlocking plants and the increased facilities obtained, this company in 1906 developed a system of electric power interlocking which has been very favorably received since its introduction, as testified by the large number of plants giving excellent service throughout the country.

Block signaling was taken up on a large scale at the beginning of 1913 when the assets of the American Signal Co. were acquired, and two very extensive installations have been completed since then on steam railroads.

In the development of this art the use of alternating current is becoming more and more important, especially for electric railroads, and this company has to its credit, amongst others, the installation of a highly developed system of this kind, including the use of automatic stops, on the New York Subway, where service and reliability are of vital importance.

Mr. S. Herbert Lanyon, who has assumed the management of the Signal Department for Pierson, Roeding & Co., is expected to reach San Francisco about March first and will thereafter make his headquarters at that point.

MAZDA BUREAU EXTENDING CAMPAIGN.

H. H. Cudmore, director of the Mazda Bureau of General Electric Company, who has been actively engaged in directing the exploitation of the trade-mark Mazda in San Francisco and central California territory during the past six months, returned to San Francisco last Monday from a trip to the home office of the General Electric Company.

Mr. Cudmore announces that the activities of the Mazda Bureau will be continued in the San Francisco territory and extended to Los Angeles, and the surrounding territory, where a branch office of the bureau will be opened at 124 W. Fourth street in the immediate future, with F. J. Blaschke in charge.

The Mazda Bureau will continue the exploitation of the trade-mark Mazda in the San Francisco and Los Angeles territories, also direct co-operative work among distributors of lamps bearing the Mazda mark in which the bureau will be assisted by Clark Baker, who is assistant to J. A. Vandegrift, Manager Oakland Mazda Lamp Division, National Lamp Works of General Electric Company, and representatives of the Edison Lamp Works of General Electric Company from the San Francisco and Los Angeles offices.

Mr. Cudmore states that trade conditions on the Pacific Coast appear to be better at the present time than anywhere in the country. This is especially true of the electrical industry, though the general depression has not been felt as severely in this field as in many others. According to Mr. Cudmore indications at such centers as Cleveland, Chicago, St. Louis and Kansas City are that the spring months will bring a decidedly brighter outlook than exists at present.

NEVADA WELFARE AND DEVELOPMENT CONFERENCE

A largely attended and very interesting conference was held at Reno, Nevada, on February 5th and 6th. The meeting drew together farmers, business men, engineers, mining men and railroad officials from all over Nevada and many from California. In addition, the State Legislature adjourned and attended the conference. The meetings were held in the buildings of the University of Nevada, the conference being called by President A. W. Hendrick of the university, who was ably assisted in his work by Professor James G. Scrugham, dean of the engineering departments.

One of the most valuable and interesting meetings of the conference was that of Friday morning. This session was opened with a paper by Professor Maxwell Adams of the university on "The Manufacture of Nitrates by Electrical Methods." He discussed the history of plants in this country and abroad which produce nitrates by the atmospheric fixation method and called attention to the great possibilities in Nevada for the manufacture of nitrates with the aid of electrical power from water power plants. This paper was followed by several papers on irrigation pumping, the titles and authors being as follows:

"Electric Irrigation Pumping," H. A. Lemmon, Commercial Agent, Truckee River General Electric Co.

"Irrigation Pumping in Central Nevada," James Edmunds, Winnemucca.

"Irrigation Pumping Opportunities in Elko County," B. G. McBride, Manager Elko Lamoille Power Company.

"Development of Underground Water Supplies in Southern Nevada," Hon. Peter Buol, Senator from Clark County.

"Costs of Electrical Irrigation Pumping," F. B. Mechling, Manager Nevada-California Power Company.

"Formal Discussion," L. W. Crehore, City Engineer, Fallon.

Each of these papers pointed out different conditions and problems which have to be considered and solved in various parts of the State in connection with irrigation pumping. One of the most striking points brought out was the diversity of conditions in the various parts of the State. In Washoe County considerable difficulty is met with in sinking the wells and making them hold up; near Winnemucca the gravel formation makes the well-sinking an easier problem; in Elko County the conditions are ideal for electric pumping, while in Southern Nevada the artesian belt renders it unnecessary to install pumps.

On Friday afternoon the conference meeting was devoted to a series of papers on the safety movement and welfare work throughout the State, the session constituting an interesting continuation of the "Safety First" work started at the University of Nevada in January, 1914. One of the subjects under discussion was "Electric Headlights," discussed by Mr. Booth, attorney for the Southern Pacific, and Frank Ingram, President of the Brotherhood of Locomotive Firemen and Engineers, in which it was brought out that the nitrogen lamp, which was tested out a year ago, has now proven universally satisfactory and meets the requirements of the employees as well as the railroad company.

Other interesting papers read during the conference were the following:

"Reclamation Problems," E. P. Hobson, United States Reclamation Service. Discussion by E. P. Osgood, United States Reclamation Service.

"The Adjudication of Water Rights," Hon. Wm. Kearney, State Engineer.

"The Commission Form of Government," Judge C. L. Harwood.

"The Control of Public Utilities," Hon. W. H. Simmons, State Railroad Commissioner.

Also a very interesting and valuable discussion on the matter of "Rural Credits," by Dean Hunt of the Agricultural Department of the University of California, Frank Drum, president of the San Francisco Savings Union Bank and Trust Company, and President Sproule of the Southern Pacific Company.

The conference closed with a banquet to 400 guests in the gymnasium of the university on Saturday evening, at which President Hendrick of the university presided, the guests including Governor E. D. Noyle, the members of the Legislature, State officials and the delegates to the conference.

TRADE NOTES.

The stock of the Camas Electric Works at Camas, Wash., has been sold, and the business is now in charge of W. G. La Berge.

The Electric Controller & Manufacturing Company, Cleveland, Ohio, announces that The O. H. Davidson Equipment Company, Ideal Building, Denver, Colorado, will act as its representative in Colorado, Utah, Montana, Wyoming, South Dakota, New Mexico and Arizona.

NEWS NOTES

INCORPORATIONS.

CHINOOK, MONT.—Chinook Water, Gas & Oil Company has been incorporated for $25,000 by J. L. Sprinkle, et al.

LINCOLN, CAL.—The Nouveau Lamp Company is a new firm organized here, with R. B. Keeler, president; P. B. Tognelli, first vice-president. The manufacture of ornamental lamps of all kinds, electroliers, etc., will be the principal industry.

BOISE, IDAHO.—Hayes Investment Company has been incorporated here to take over certain property owned by Hayes & Hayes of Rock Island, Ill., and to build, own, operate and control power plant; capital stock $100,000; incorporators, Daniel Hayes and Daniel Hayes Jr., of Rock Island, Ill., and B. E. Hyatt, Boise.

FINANCIAL.

SAN FRANCISCO, CAL.—The board of supervisors has voted to set aside $15,604 from the revenue of the Municipal railway for the purpose of meeting for this year claims arising against it under the provisions of the workingmen's compensation act.

LOS ANGELES, CAL.—Final payment of $50,225 on the great water wheels of the aqueduct has been ordered made to the Pelton Water Wheel Company, which sold the apparatus to the city. The total cost of the wheels was $194,000. They will be placed in San Francisquito canyon for the generation of electricity.

OAKLAND, CAL.—The board of directors of the Oakland, Antioch & Eastern Railway has named A. Christensen, J. J. Mahoney and William Fries to represent the board on the committee, which will make out a plan for refinancing the company. These appointees, with John Lawson, L. S. Bachman and Fred H. Beaver, representing the security holders, will select a seventh member thereby completing the committee.

SAN FRANCISCO, CAL.—The board of supervisors has received the formal offer of the Spring Valley Water Company to sell its properties for $34,500,000. This is another step necessary to the proceedings before the question of the purchase of the properties can be submitted to a vote of the people. Mayor Rolph told the supervisors that at a special meeting of the advisory water committee, held in his office, Monday morning, it had been decided to recommend that the election be held on Tuesday, April 20. In answer to an inquiry as to what was the present status of the condemnation suit began by the city to secure these properties through court proceedings, Mayor Rolph said that the condemnation suit had been temporarily halted, when the negotiations for the purchase of the properties had been taken up. The suit, however, he said, can be proceeded with after the election is held if the proposition to buy is defeated.

ILLUMINATION.

BOISE, IDAHO.—The estimate of the city engineer for a lighting system in South Boise is $4,639.30.

HARDIN, MONT.—James Thorpe Company, Denver, has petitioned the council for a franchise to erect and operate a gas plant here.

TILLAMOOK, ORE.—J. R. Wheeler, electric engineer of this city, will soon begin the construction of a lighting plant at Bar View.

COLFAX, WASH.—An ordinance has been introduced granting a franchise to the Elberton Building & Power Company for supplying light and power.

COLFAX, WASH.—An ordinance has been introduced granting a franchise to the Elberton Building & Power Company for supplying light and power.

MARSHFIELD, ORE.—A severe electrical and wind storm damaged the Oregon Power Company's auxiliary plant, at North Bend to the extent of $6000.

IONE, ORE.—J. B. Sparks will install an electric lighting plant to furnish light for a moving picture show. It will furnish light and power to the public.

LOS ANGELES, CAL.—There is a movement to have electric lights along Long Beach Boulevard. All the necessary arrangements are said to have been made.

RED LODGE, MONT.—Fort Benton has disposed of $50,000 worth of bonds, the proceeds of which will be used in the construction of a new sewer system, and an electric light plant.

GLENDIVE, MONT.—The council has passed a resolution calling for an election for February 20 to submit to vote the question of granting a gas franchise to Miles W. Milligan, Miles City.

LEXINGTON, ORE.—J. B. Sparks of Heppner has interested business men here in the light question, and they have promised him sufficient business to warrant him to go ahead and establish a plant.

RATON, N. M.—The local electric company is conducting a canvass to determine the feasibility of establishing a gas plant in Raton. The proposed plant would involve an expenditure of $40,000.

GOLDHILL, ORE.—Bids will be received by the City Recorder, B. G. Harding, until March 1, for the installation of a street lighting system and furnishing electric current for a period of 10 years.

CORDOVA, A T.—Harry H. Knox, president and manager of the Alaska Electric Consolidated Company, expects to return soon with funds for the construction of a power plant here for which he was granted a franchise some time ago.

SAN DIEGO CAL.—When the city renews its contract with the San Diego Consolidated Gas & Electric Company for street lighting, it will provide for all-night lights. The council has authorized another contract to become effective June 1.

SILVERTON, ORE.—Bids will be received by Roscoe D. Ames, city recorder, up to February 15th for cluster light posts, fixtures for same, wiring, posts and connections to service wires. A certified check payable to the city of Silverton is required with bid.

TOMBSTONE ARIZ.—Mayor W. F. Kuchenbecker, has returned from Bisbee, where he was in conference with Walter Douglas, of the Phelps-Dodge Company in regard to electric lights for Tombstone. As a result of his trip Electrical Engineer Rossi will arrive in a few days to estimate the cost.

NOGALES, ARIZ.—R. A. Davidson of Ives & Davidson, New York, who is interested in the International Gas Company, and has planned new electric plant and ice plant, has arrived in the city, and work will begin at once. E. J. Richards will have charge of the construction of the building and the installation of the plant.

FRESNO, CAL.—Actual construction of Fresno's new electrolier system will be started within the next 30 days. The system will be completed not later than June 15. The trustees awarded to the Woodhill-Hulse Electric Company of Los Angeles, the contract for putting in the system. The cost will be $36,973. Cast iron poles will be used. There were seven biddrs. The highest was $49,950 for the concrete posts.

GLENDALE, CAL.—The public service department of the city of Glendale has just submitted to the board of trustees its semi-annual report of operations for the period ended January 1, 1915. This department has control of the water and electric light systems owned by the city. The electric light system has an investment of $140,155.25 with a debt of $101,045.05. These systems have both operated at a considerable profit since being taken over by the city. The electric light department shows a net profit for the last six months, after deducting all operating expenses, depreciation and interest on the debt, of $3292.63. There are now about 2800 consumers connected to the electric light system and 1950 to the water system. During the last six months the electric light system made a net gain of 185 consumers, or over one a day for the period. The city is preparing to continue the five-light ornamental standards on Brand boulevard south from Sixth street to the south city limits. This will give over a mile of lights on this street, with over a mile more on Broadway and Glendale avenue.

TRANSMISSION.

LOVELOCK, NEV.—It is announced here that the new power line from Lahontan government dam to the mining camp of Rochester will be completed by February 15, with sub-stations at Lovelock, Rochester and Hazen.

SAN FRANCISCO, CAL.—The contract between the Pacific Gas & Electric Company and the Great Western Power Company whereby the latter supplies the former with electric power, has been renewed for 18 months.

ASHLAND, ORE.—The California-Oregon Power Company has made overtures to the city council towards the reinforcement of the municipal light and power plant. It will furnish the city system with power at wholesale rates, leaving the city to extend the field and retail the current. As it is at present, both systems occupy the territory and considerable friction is caused by the dual plants.

TRANSPORTATION.

SAN FRANCISCO, CAL.—The board of works has been directed to prepare plans and specifications and advertise for bids along the lines of Engineer O'Shaughnessy's plan No. 9 for the Church street railway.

SAN FRANCISCO, CAL.—The utilities committee has advised the city engineer to proceed with the preparation of plans for the municipal railway across Golden Gate Park, the cost of which is estimated at $200,000. This amount is to be taken out of Geary street road earnings. The road across the park is to be sunken and the crossings will be bridged over. The cost will be $50,000 more than for level construction.

FRESNO, CAL.—No action was taken last week by the city trustees regarding the sale of the city franchise for the Fresno Interurban Railroad Company's line into Fresno, as there were no bidders. In the legal advertisement February 1 was announced as the time for opening bids and awarding the franchise to the highest bidder. John B. Rogers, president of the company, who is now in San Francisco, said that the franchise should not come up for sale for four weeks. He declared that it should be advertised for ten days and then there should be a lapse of 20 days before the franchise could be awarded.

WATERWORKS.

SAN FERNANDO, CAL.—An ordinance has been adopted by the board of trustees for the acquisition and construction of water works, necessary for supplying water to the city and to be used for irrigating purposes, and second for the acquisition of fire apparatus. The cost of the waterworks to be $65,000 and $8000 for fire apparatus, to be paid out of the annual income and revenue of the city.

OREGON CITY, ORE.—The special election when the South Fork water project will be submitted to the voters will be held about March 1, was the statement of William Andresen, chairman of the South Fork committee.

SACRAMENTO, CAL.—Professor Chas. Gilman Hyde of the University of California and G. H. Welhelm have been named as consulting engineers to assist in the work of preparing plans and laying the new Sacramento water mains for which $2,000,000 in bonds was recently voted.

PORTLAND, ORE.—Plans and specifications are being rushed to completion by engineers in the employ of the Eugene water board for the proposed reservoir, to cost $30,000. Bids will be called for in two weeks, and a contract let about March 1. In addition to the reservoir the water board will spend about $10,000 on water mains this year.

GLENDORA, CAL.—The board of trustee has awarded a contract to the Lacy Manufacturing Company for furnishing 6 and 8 in. riveted pipe, 14 and 16 in. gauge to be used in the reconstruction of the distributing system for domestic water. The board also awarded to Mark-Lally company a contract to furnish 2 and 4 in. standard screw pipe.

SAN DIEGO, CAL.—Plans and specifications will be ready at an early date for the reservoir to be used in connection with the new Bonita pipe line, bids for which have been received and have been referred to the water department. The reservoir will be located on high ground near the Mount Hope cemetery, and will have a 15,000,000 gallon capacity. The cost will be about $75,000.

BUTTE, MONT.—Preliminary steps toward the feasibility of the city purchasing the plant and equipment of the Butte Water Company have been taken by the city council. The report of the special committee to investigate the purchase recommended that the mayor, city attorney and commissioner of public works negotiate with experts with a view of ascertaining the cost of an appraisement of the plant and equipment of the Butte Water Company.

BILLINGS, MONT.—A. B. McDonnell of the Kansas City firm of Burns & McDonnell, engineers for the proposed new water system, will arrive in Billings soon to explain plans to local contractors, according to a letter received by City Engineer Durland. Bids will be called shortly. Four contracts probably will be let, one for construction of buildings and concrete and excavation work, one for furnishing and installing filter equipment, one for building extensions and laying new water mains, and one for installing a new motor and pump for the distributing system.

TELEPHONE AND TELEGRAPH.

SPOKANE, WASH.—Corporation Counsel H. M. Stephens has rendered an opinion that the Pacific Telephone Company cannot legally operate under the franchise of the Home Telephone Company.

FAIRBANKS, ALASKA.—The Fairbanks Telephone Company has asked the community to grant a further franchise for a period of ten years.

PORT TOWNSEND, WASH.—The Independent Telephone Company is removing its exchange from Irondale and its subscribers there will be connected with the Port Townsend exchange.

COEUR d'ALENE, IDAHO.—A franchise has been granted to H. G. Kirkpatrick and Frank Short to erect and maintain a telephone line along the Tekoa road No. 398, Potlatch mission road No. 314, and Sanders Potlatch road No. 385.

TACOMA, WASH.—The council has passed Mayor Fawcett's telephone franchise ordinance, which provides for a 25 per cent reduction in business telephone rates and 33 1-3 per cent reduction in residence rates.

ALPHABETICAL INDEX TO ADVERTISERS

The letter and number before each name are used in the classified page opposite

A-1 American Ever-Ready Works of National Carbon Co....
Los Angeles; 755 Folsom Street, San Francisco; Seattle.

B-1 Baruch Electric Controller Corporation.....
51 Grant Avenue, San Francisco; 424 13th St., Oakland.

B-2 Benjamin Electric Manufacturing Co.....
Rialto Bldg., San Francisco.

B-3 Blake Signal and Manufacturing Co..... 4
680 Howard Street, San Francisco.

B-5 Bridgeport Brass Co..... 3
(See Pierson, Roeding & Co.)

B-6 Berkeley Electric Cooker Co.....
1932 Center Street, Berkeley.

B 7 Busch-Sulzer Bros.-Diesel Engine Co..... 4
Rialto Bldg., San Francisco.

C-1 Century Electric Co..... 3
614 South Grand Avenue, Los Angeles; 56 Natoma Street, San Francisco; Seattle; Spokane.

C-2 Colonial Lamp Works.....
444 Market Street, San Francisco.

C-3 Crocker-Wheeler Co.....
1631 Winfield St., Los Angeles; Salt Lake City; First National Bank Bldg., San Francisco; Seattle.

C-5 Crouse, Hinds & Co.....
Chicago, Ill.

C-4 Cutler-Hammer Manufacturing Co..... 5
579 Howard Street, San Francisco; Morgan Bldg., Portland, Ore.; San Fernando Bldg., Los Angeles.

D-1 D. & W. Fuse Co.....
Western Electric Co.

D-2 Dearborn Drug and Chemical Works..... 4
355 East Second Street, Los Angeles; 301 Front Street, San Francisco.

E-1 Edison Lamp Works of General Electric Co.....
Rialto Bldg., San Francisco.

E-2 Edison Storage Battery Supply Co.....10
441 Golden Gate Avenue, San Francisco.

E-3 Electric Agencies Co.....
247 Minna Street, San Francisco; Central Building, Los Angeles.

E-4 Electric Storage Battery Co.....
Pacific Electric Bldg., Los Angeles; Spalding Bldg., Portland; 118 New Montgomery Street, San Francisco; Colman Bldg., Seattle.

F-1 Fairbanks, Morse & Co.....
Los Angeles; Portland; 651 Mission Street, San Francisco; Seattle; Spokane.

F-2 Fort Wayne Electric Works of G. E. Co.....
Rialto Bldg., San Francisco; Colman Bldg., Seattle.

G-1 General Electric Co.....
124 W. Fourth Street, Los Angeles; Worcester Bldg., Portland; Rialto Bldg., San Francisco; Colman Bldg., Seattle; Paulsen Bldg., Spokane.

H-1 Habirshaw Wire Co..... 4
(See Western Electric Company.)

H-2 Hemingray Glass Co.....10
330 So. L. A. Street, Los Angeles; 345 Oak Street, Portland; 807 Mission Street, San Francisco.

H-4 Holophane Works .....
Aronson Bldg., San Francisco.

H-5 Hunt, Mirk & Co.....
141 Second Street, San Francisco.

H-6 Hubbard & Co.....
Rialto Bldg., San Francisco.

I-1 Indiana Rubber and Insulated Wire Co..... 2
Fobes Supply Co., Portland and Seattle.

K-1 Kellogg Switchboard and Supply Co.....
Aronson Bldg., San Francisco.

K-3 Klein & Sons, Mathias .....
579 Howard Street, San Francisco.

K-4 K-P-F Electric Co.....10
37 Stevenson Street, San Francisco.

L-1 Leahy Manufacturing Co.....
Eighth and Alameda Streets, Los Angeles.

L-2 Locke Insulator Manufacturing Co..... 3
(See Pierson, Roeding & Co.)

M-2 McGlauflin Manufacturing Co.....
Sunnyvale, Cal.

M-4 Morse Chain Co.....
Monadnock Bldg., San Francisco.

M-3 Moore & Co., Charles C..... 3
Van Nuys Bldg., Los Angeles; Spalding Bldg., Portland; Kearns Bldg., Salt Lake City; Sheldon Bldg., San Francisco; Mutual Life Bldg., Seattle; Santa Rita Hotel Bldg., Tucson.

N-1 Nason & Co., R. N.....
151 Potrero Avenue, San Francisco.

N-2 National Conduit & Cable Co., The.....
Trust and Savings Bldg., Los Angeels; Rialto Bldg., San Francisco.

N-3 National Lamp Works of G. E. Co.....
(All Jobbers.)

N-4 New York Insulated Wire Co.....
629 Howard Street, San Francisco.

O-1 Okonite Co. (The) 12
(All Jobbers.)

P-1 Pacific Electric Manufacturing Co.....
80 Tehama Street, San Francisco.

P-2 Pacific States Electric Co..... 2
236-240 So. L. A. Street, Los Angeles; 90 Seventh Street, Portland; 526 Thirteenth Street, Oakland; 575 Mission Street, San Francisco; 307 First Avenue, So., Seattle.

P-4 Pelton Water Wheel Co.....10
2219 Harrison Street, San Francisco.

P-5 Pierson, Roeding & Co..... 3
Pacific Electric Bldg., Los Angeles; Spalding Bldg., Portland; Rialto Bldg., San Francisco; Colman Bldg., Seattle.

P-7 Pittsburgh Piping & Equipment Co.....12
Monadnock Bldg., San Francisco.

S-1 Schaw-Batcher Company, Pipe Works, The..... 4
211 J Street, Sacramento; 356 Market Street, San Francisco.

S-2 Simonds Machinery Co.....
117-19-21 New Montgomery Street, San Francisco.

S-3 Simplex Electric Heating Co.....12
612 Howard Street, San Francisco.

S-4 Southern Pacific Co.....10
Flood Bldg., San Francisco.

S-6 Standard Underground Cable Co.....
First National Bank Bldg., San Francisco; Hibernian Bldg., Los Angeles; Yeon Bldg., Portland; Central Bldg., Seattle, Wash.

T-1 Thomas & Co., R..... 12
(See Western Electric Co.)

V-1 Van Emon Elevator Co.....
56 Natoma Street, San Francisco.

W-1 Wagner Electric Manufacturing Co..... 3
Rialto Bldg., San Francisco.

W-2 Western Electric Co.....
8th and Santee Streets, Los Angeles; 507 Sixteenth Street, Oakland; 680 Folsom Street, San Francisco; 907 First Avenue, Seattle; 45 North Fifth Street, Portland, Ore.

W-4 Westinghouse Electric and Manufacturing Co..... 6
50-52 East Broadway, Butte; Van Nuys Bldg., Los Angeles; Couch Bldg., Portland; 212 So. W. Temple, Salt Lake City; 165 Second Street, San Francisco; Second and Cherry Streets, Seattle; Paulsen Bldg., Spokane.

W-5 Westinghouse Machine Co.....
141 Second Street, San Francisco.

W-6 Westinghouse Lamp Co.....
(See Westinghouse Electric and Manufacturing Co.)

W-7 Weston Electrical Instrument Co.....
682 Mission Street, San Francisco.

W-8 Western Pipe & Steel Co.....
444 Market Street, San Francisco; 1758 North Broadway, Los Angeles.